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And thus the course of the water which issues by the Jet, is always entertained in the same state; because that proportionably, as the impulse is strong, the water entring faster, and consequently in greater quantity into the Pot, makes a greater compression of the Air, which the more strongly it is compressed and penned in, returns also with the greater force into its native state by means of its spring, and consequently throws out the water with greater force.

An Extract of a Letter written by Signor Cassini to the Author of the Journal des Scavans, containing some Advertisements to Astronomers about the Configurations, by him given of the Satellites of Jupiter, for the years 1676, and 1677, for the verification of their Hypotheses.

THE Configurations of the *Satellites of Jupiter*, which are observed this year 1676, and which may be observed the next year, are of so great importance to the verifying of their Hypotheses, that Signor *Cassini* thought fit to advertise Astronomers, not to let this occasion slip (which doth not present it self but twice in 12 years) of observing them with a singular care and attention. For, by comparing the Observations of this year with those of the next, they will find an apparent Inversion of the whole System of the Satellites, which will come to pass towards the end of *March* next, according to his particular Hypotheses, which he proposes to verify by comparing these Observations with those of *Galileus, Marius, and Hodierna*, who undertook to dress Tables of their Motions.

Since the *Satellites* have the center of *Jupiter* for the center of their particular motions, and that the circles by them described are not directly opposit to the Earth nor the Sun, there is always a part of each of those circles inferior to *Jupiter*, and another superior to him, and *this*, being compared to the center of the apparent disque of *Jupiter*, is sometimes turned to the South, sometimes to the North, by a perpetual change of inclination to our visual ray. *Galileo* believed formerly, to have found Rules of this Phænomenon, or perpetual change of inclination, by supposing the planes of those circles to be always parallel to the Ecliptique; for, by *Galilei's* supposition, the Satellites in the superior part of their circles should have their latitude, in respect of the center of *Jupiter*, ever contrary to the latitude of *Jupiter* in respect of the Ecliptique; which the Observations of this year contradict, forasmuch as the Satellites, being in the superior part of their circles, near to their conjunction

with *Jupiter*, have also the Meridional Latitude in respect of his center, as *Jupiter* hath, since the month of *March*, in respect of the Ecliptique.

The contrariety of latitude between one Satellit, being in the superior part of his circle, and another being in the inferior part of his, is more sensible in the encounter of a Direct, which is always superior, with a Retrograde, which is always inferior, and particularly near to *Jupiter*.

Signor *Cassini* foresees, 1. That, at the end of *March* next, the Satellites will no more have any latitude in respect of *Jupiter*'s center, and that they will appear in a streight line in all their configurations between themselves and with *Jupiter*, and will eclipse one another: which, according to *Galileo*, should have come to pass ever since the first months of this present year, when *Jupiter* passed from the North-side to that of the South, and not the next year, when *Jupiter* will have a great Southern latitude. 2. That the streight line of the Satellites will be inclined to the Ecliptique, contrary to the *Galilean* Hypothesis. 3. That this disposition of the Satellites in a streight line in their encounter will last but a few days, though *Galileo* assure us that it lasts many months. 4. That the next Summer the scituacion of the circles of the Satellites will be found inverted, in respect of that which they have now; for, the superior Semi-circles, which at present are turned to the South, will then be turned to the North: which will overthrow the Hypotheses of *Marsins* and *Hodierne*, who suppose them always turn'd the same way.

These Observations will serve to verifie the Nodes of the Orbis of the Satellites with the Orb of *Jupiter*, and the Obliquity of the one to the others; which are the two Keys to the Theory of the Satellites. Signor *Cassini* settles these Nodes towards the thirteenth degree of *Leo* and *Aquarius*; but *Galileo* supposed them always to be with the Nodes of *Jupiter*, which are towards the beginning of *Cancer* and *Capricorn*. He finds the Obliquity of their circles to the orbite of *Jupiter* almost double to the obliquity of this orbite to the Ecliptique; whereas *Galileo* supposes it equal.

Lastly, he (*Cassini*) retracts the motion, which he introduced to the Nodes of the Satellites (such as is described at the end of his first Tables) only to reconcile the Observations of *Galilei* with his, and he acknowledges, that the obliquity of their circles is permanent.

The goodness of Signor *Cassini*'s System, and the imperfection of the Hypotheses of *Galilei* are demonstrated by the Eclipses of the Satellites

Satellites that come to pass conformable to the calculus of *Cassini*, and differ days and hours from the calculus and predictions made upon the hypotheses of *Galilæi*: Besides that there should happen a great many which do not happen according to the system of *Cassini*. E.g. according to the hypothesis of *Galilæi*, the fourth of the Satellites should have more than 90 Eclipses in a year, of the duration of three or four hours; but according to the system of *Cassini*, the same Satellite will be three or four years without suffering any Eclipse. Which proceeds from nothing but the false situation of the Orbs supposed by *Galilæi*; as the great difference of the time of the Eclipses that happen depends from this, that neither *Galilæo* nor the other Astronomers do separate from the proper motion of the Satellites the appearances which do befall it by that of *Jupiter* about the Sun. And therefore 'tis, that they have taken for a simple and equal motion a motion compounded of an equal and unequal; whence they have slipped into an error about the Mean motions, which in progress of time hath so increased, that the Configurations drawn from their hypotheses for that time have almost no likeness at all with those that are observed.

These old hypotheses were therefore far off from serving to find the Longitudes, as their Authors intended them; since it was impossible for them nor only to observe the Eclipses of the Satellites for some years to the nearness of an hour, but even to make us know and distinguish at this time one Satellite from another, whereas by the System of Signor *Cassini* one may predict for many years to come the Eclipses of the Satellites with as much preciseness, as those of the Sun and Moon by the Astronomical Tables.

Methodus directa & Geometrica, cuius ope investigantur Aphelia, Eccentricitates, Proportionesque orbium Planetarum primariorum, absque supposita æqualitate anguli motûs, ad alterum Ellipses focus, ab Astronomis hactenus usurpatâ. Auth. Edmundo Halley Jun. è Collegio Reginæ Oxon.

Modus Terræ annuus per Eclipticam, opticam inæqualitatem inducit motibus cæterorum planetarum, Astronomis Copernicanis nomine Parallaxeos orbis notissimam; quam quidem inæqualitatem, ex observationibus non multâ operâ datam, methodi sequentis basin firmissimam constituo; ubi præter observata nihil aliud supponitur, quam quod orbes Planetarum sint Ellipses, quodque Sol in foco omnium orbibus communit, sit constitutus, & denique, quod tempora periodica singulorum

T_{ab}. 1
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